Assessing the Effects of Tidal Restoration in the Suisun Marsh: Implications for Waterfowl Carrying Capacity and Wetland Management Options.

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Public Comments

No public comments were received for this proposal.

Technical Synthesis Panel Review

Proposal Title

#0176: Assessing the Effects of Tidal Restoration in the Suisun Marsh: Implications for Waterfowl Carrying Capacity and Wetland Management Options.

Final Panel Rating
adequate

Technical Synthesis Panel (Primary) Review

TSP Primary Reviewer's Evaluation Summary And Rating:

The objectives of this project are to determine how tidal restoration efforts influence waterfowl populations in the Suisun Marsh, because efforts will presumably alter food production, and how management of diked wetlands can increase food production to potentially mitigate any losses. The project assumes that restoration will be detrimental for waterfowl populations by decreasing food supply; however, like one reviewer noted, historically tidal marsh ponds were highly productive wintering waterfowl habitats. Furthermore, the authors admit that "most food plants used by waterfowl occur naturally in tidal areas of the Marsh, albeit in lower densities". It is somewhat unclear how this research fits into CALFED's main priorities and how this project will provide insight into other taxa. Also, it must be remembered that the original basis for diking large portions of the Suisun marsh was tied to increasing agricultural production in the region—not waterfowl management. Restoration is based on returning the landscape back to more historic conditions, and is focused on all elements of biodiversity. The objectives are clear and are tied directly into the conceptual model outlined in the proposal. The conceptual model is clear, yet potentially oversimplified by focusing only on food limitation and energy requirements of waterfowl. While the authors note

that food availability is probably the strongest limiting factor for wintering waterfowl, it certainly is not the only factor. The authors propose collecting data to parameterize the TRUMMET model, a stochastic bioenergetic model developed for waterfowl, to estimate the carrying capacity and subsequent effects of restoration on waterfowl populations. The overall approach to parameterizing this model is justified, based on the simulated scenarios described in the text and figures. The main concerns are sample size, site selection, and error estimation in the model. Only 20 sites are proposed for managed sites and only 10 are proposed for tidal sites, with 25 samples in each site. Because the authors are attempting to provide food estimates relative to location, habitat type, water salinity, and water delivery facilities, the sample size does not seem large enough. Perhaps a better design would include sampling more sites, but fewer samples per site (15–20, as noted by the authors as being sufficient for estimates). Furthermore, sites should be chosen based on some sort of stratified random design if inferences in modeling are to be robust and generalizable. Finally, as described, the TRUMMET model does not incorporate uncertainty in parameter estimates and does not provide an estimate of error for carrying capacity. Therefore, it will be difficult to interpret results of the model. While the TRUMMET model is informative, there are certain assumptions that the reviewers noted. For example, the model assumes all ducks behave similarly, but obviously each duck species will have varying food preferences and plasticity to foraging in the environment. Also, varying levels of metabolism of plant species by waterfowl needs to be taken into account. Ideally, some estimate of basic food preference should be included as well. The model is not spatially explicit and does not consider issues like spatial food subsidies from nearby areas. Are there portions of the wintering waterfowl population that use the Suisun for roosting, social, nocturnal and shelter habitat and seek food resources in adjacent portions of the valley? There also needs to be a similar effort tied to modeling changes in extent of submerged aquatic vegetation due to tidal flow restoration. Basing "impacts" of tidal flow restoration strictly upon seed availability for waterfowl seems far too restrictive. It's an important consideration but

not the only factor determining quality waterfowl foraging habitat in this area. Overall, the proposed work is feasible and the investigators are well qualified to conduct the investigation. Reviewers noted that the budget is somewhat high for the limited field work and products that should be delivered from the investigation. Incorporating results from application of the TRUEMET model would be informative to understanding population dynamics of waterfowl, but are rather limited in context (only the Suisan Marsh). Understanding the dynamics between wintering waterfowl numbers and carrying capacity, related to foraging quality, has always been difficult to attain for waterfowl biologists. Will these estimates of food production be relevant to other taxa? It remains unclear if and how this study will broaden our knowledge of ecosystem processes and community dynamics for non−waterfowl species.

Additional Comments:

The objectives of this project are to determine how tidal restoration efforts influence waterfowl populations in the Suisun Marsh, because efforts will presumably alter food production, and how management of diked wetlands can increase food production to potentially mitigate any losses. The project assumes that restoration will be detrimental for waterfowl populations by decreasing food supply; however, like one reviewer noted, historically tidal marsh ponds were highly productive wintering waterfowl habitats. Furthermore, the authors admit that "most food plants used by waterfowl occur naturally in tidal areas of the Marsh, albeit in lower densities". It is somewhat unclear how this research fits into CALFED's main priorities and how this project will provide insight into other taxa. Also, it must be remembered that the original basis for diking large portions of the Suisun marsh was tied to increasing agricultural production in the region—not waterfowl management. Restoration is based on returning the landscape back to more historic conditions, and is focused on all elements of biodiversity. The objectives are clear and are tied directly into the conceptual model outlined in the proposal. The conceptual model is clear, yet

potentially oversimplified by focusing only on food limitation and energy requirements of waterfowl. While the authors note that food availability is probably the strongest limiting factor for wintering waterfowl, it certainly is not the only factor. The authors propose collecting data to parameterize the TRUMMET model, a stochastic bioenergetic model developed for waterfowl, to estimate the carrying capacity and subsequent effects of restoration on waterfowl populations. The overall approach to parameterizing this model is justified, based on the simulated scenarios described in the text and figures. The main concerns are sample size, site selection, and error estimation in the model. Only 20 sites are proposed for managed sites and only 10 are proposed for tidal sites, with 25 samples in each site. Because the authors are attempting to provide food estimates relative to location, habitat type, water salinity, and water delivery facilities, the sample size does not seem large enough. Perhaps a better design would include sampling more sites, but fewer samples per site (15–20, as noted by the authors as being sufficient for estimates). Furthermore, sites should be chosen based on some sort of stratified random design if inferences in modeling are to be robust and generalizable. Finally, as described, the TRUMMET model does not incorporate uncertainty in parameter estimates and does not provide an estimate of error for carrying capacity. Therefore, it will be difficult to interpret results of the model. While the TRUMMET model is informative, there are certain assumptions that the reviewers noted. For example, the model assumes all ducks behave similarly, but obviously each duck species will have varying food preferences and plasticity to foraging in the environment. Also, varying levels of metabolism of plant species by waterfowl needs to be taken into account. Ideally, some estimate of basic food preference should be included as well. The model is not spatially explicit and does not consider issues like spatial food subsidies from nearby areas. Are there portions of the wintering waterfowl population that use the Suisun for roosting, social, nocturnal and shelter habitat and seek food resources in adjacent portions of the valley? There also needs to be a similar effort tied to modeling changes in extent of submerged aquatic vegetation due to tidal flow restoration. Basing "impacts" of tidal flow

restoration strictly upon seed availability for waterfowl seems far too restrictive. It's an important consideration but not the only factor determining quality waterfowl foraging habitat in this area. Overall, the proposed work is feasible and the investigators are well qualified to conduct the investigation. Reviewers noted that the budget is somewhat high for the limited field work and products that should be delivered from the investigation. Incorporating results from application of the TRUEMET model would be informative to understanding population dynamics of waterfowl, but are rather limited in context (only the Suisan Marsh). Understanding the dynamics between wintering waterfowl numbers and carrying capacity, related to foraging quality, has always been difficult to attain for waterfowl biologists. Will these estimates of food production be relevant to other taxa? It remains unclear if and how this study will broaden our knowledge of ecosystem processes and community dynamics for non−waterfowl species.

Technical Synthesis Panel (Discussion) Review

TSP Observations, Findings And Recommendations:

Assessing the Effects of Tidal Restoration in the Suisun Marsh: Implications for Waterfowl Carrying Capacity and Wetland Management Options.

The authors suggest that tidal restoration may be detrimental to waterfowl, but historically tidal marshes were highly productive and had a high abundance of different species than those that are being studied here.

Hence, the proposed waterfowl species may not be the best species to use to evaluate the success of the restoration.

Although the study was considered feasible, it is not clear whether these studies will change anything that is being done in restoration.

The researchers do not address the expected salinity of the restored wetland. This is critical for understanding the

potential changes in waterfowl habitat and vegetation.

The proposal was very clearly written. A number of modeling scenarios were examined, and the proposal identifies and offers a straight−forward approach to determining unknowns. However, the model is fairly simplistic: only food supply is looked at, but not predation or other factors.

Furthermore, the model does not provide an estimate of error. The model output compares available food to the food amount needed by waterfowl, but it is not clear how large a difference in model outputs would be significant.

External reviewers differed in their rating, although the review with the highest rating was not substantive. Problems were identified with the proposed seed decomposition study. Oven−drying seeds will alter decomposition rates.

Rating: adequate

Technical Review #1

proposal title: Assessing the Effects of Tidal Restoration in the Suisun Marsh: Implications for Waterfowl Carrying Capacity and Wetland Management Options.

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The objectives were clearly stated and were tied directly to the conceptual model. I would prefer to see a set of hypotheses that the study intends to test. I must say that an underlying, a priori assumption by the authors is that waterfowl food production will decline if tidal flow is restored to 5000 acres (**
Rating	**good**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**I think the use of the TRUEMET model is appropriate, however, I have always been troubled by the discounting of vegetative food types with this approach. I have also seen conclusions in other parts of the country using this approach tied to "duck use days" and available seed/agricultural waste grain, that looked at ALL waterfowl species. Obviously, each duck species will have varying food habits and these other efforts chose to ignore that basic fact. For the present study, there needs to be some consideration given to the role of vegetative foods (eg., sago**

	pondweed, ruppia, water nymph, etc) and macroinvertebrates. Also, varying levels of metabolism of plant species by waterfowl needs to be taken into account. Ideally, some level of basic food habits study might be appropriate as well. It would be very importatant to observe ducks feeding for a period of time in different habitat types before collecting them. **While much of the management prescription in the Suisun is tied to alkali bulrush-- it may not be that great of a source of energy for waterfowl due to low net energy metabolism (Swanson and Bartonek, 1970:JWM 34). Also, the model assumes a mostly "closed population." Are there data available to substantiate this point? Are there segments of the wintering waterfowl population that use the Suisun as roosting, social, nocturnal and shelter habitat and seek food resources in flooded agricultural fields in adjacent portions of the valley?** **As already mentioned, the conceptual model was clearly stated. I think the overall research application is appropriate and the scale is appropriate as well.**
Rating	**good**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**With previous concerns included, I feel the approach is valid and well designed. The authors have been involved in previous efforts that are somewhat similar. However, with any modelling effort...it's critical that the key underlying assumptions have been validated a priori. There may be more work to do here (see above).**

	The authors (esp. Petrie and Dugger) have a good background in determining TME from waterfowl foods. I had just one question regarding the experimental design of the feeding trials...is each bird in the trial to be considered a "block" within the design? This wasn't totally clear to me.
Rating	**good**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**There needs to be a similar effort tied to modelling changes in extent of submerged aquatic vegetation due to tidal flow restoration. Basing "impacts" of tidal flow restoration strictly upon seed availability for waterfowl seems far too restrictive. It's an important consideration but not the only factor determining quality waterfowl foraging habitat in this area.** **Overall, the approach that is outlined is feasible and I'm sure some good data would be generated. The scale is appropriate but I have concerns about basing study site selection strictly upon management strategies. Using prescriptive management-- habitats may be more homogenous than what the study should require. An assumption within Task 2 may be problematic. It seems to me that using the same suite of plant species to evaluate in both tidal and diked sites introduces a major source of bias. No one would expect that same plants species composition in both habitat types...the key issue here is consideration of all potential food sources for waterfowl.**
Rating	**fair**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**I'm not sure an analysis of monitoring is really applicable to this study. However, it may actually be quite appropriate to integrate some long−term monitoring to track changes in key waterfowl food sources into the tidal restoration project. A stratified, random placement of transects throughout the Suisun Marsh could be very informative. The authors make no mention of long term aspects of their proposed project.**
Rating	**not applicable**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**With the constraints inherent with this project (see above), I feel that there will be products of value derived from this effort. Incorporating results from application of the TRUEMET model would be informative to overall population modelling efforts in the Pacific Flyway. Understanding the dynamics between wintering waterfowl numbers and carrying capacity −− related to foraging quality−− has always been difficult to attain for waterfowl biologists.** **Great care must be taken to interpret the results properly. This is a concern since the authors seem to have a preconceived notion that tidal restoration will degrade waterfowl foraging habitat in Suisun Marsh. This is understandable since traditional waterfowl habitat management has stressed overengineering of systems (especially coastal habitat) and minimal**

	consideration of estuarine, migratory fish and crustaceans.
Rating	**good**

Additional Comments

Comments	**The overall flow and editorial content of the proposal was below average. There were numerous typos, fragmented sentences, citations not included in the LIT CITE and citations in the LIT CITE that were not included in the text. It appeared this proposal was put together in a hurry with little editorial input.** **My main concerns are these: ** preconceived notion that tidal restoration will be significantly harmful to waterfowl foraging habitats ** discounting of non-seed bearing waterfowl foods in the overall modelling effort ** Assumption that the Suisun waterfowl population is "closed" and does not forage outside of the the marsh ** Approach for selection of study sites and inclusion of the same suite of plant species in evaluating managed and tidal habitats.**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**I don't doubt the abilities of the authors to complete this effort. They all have good records of producing work and completing similar types of projects.**
Rating	**very good**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	

	The budget seems quite high to me especially since there will be a minimal amount of fieldwork (restricted to tracking seed samples over time in the marsh). The feeding trial work is intensive but still is appreciably less than the food sampling. Could the field work on food sampling increase efficiency by sampling in both managed and tidal habitats during the same field event?
Rating	**fair**

Overall

Provide a brief explanation of your summary rating.

Comments	**I think this effort could add additional understanding of the role of managed habitats versue tidal habitats in the foraging ecology of waterfowl in the Suisun Marsh. How well these data could be incorporated into the overall restoration monitoring effort remains to be seen. Also, I feel it is vital to incorporate vegetative foods into this effort. Historically, waterfowl fed extensively of foods available in tidal pools. Also, it must be remembered that the original basis for diking large portions of the Suisun marsh was tied to increasing agricultural production in the region...not waterfowl management. The restoration vision is based more upon all elements of biodiversity-- from delta smelt to snowy plovers. While it is important to understand the potential impacts to waterfowl populations of the Suisun, the desired future condition tied to restoration goals, should not be restricted to this aspect.**
Rating	**good**

Technical Review #2

proposal title: Assessing the Effects of Tidal Restoration in the Suisun Marsh: Implications for Waterfowl Carrying Capacity and Wetland Management Options.

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**excellent ideas about something we really need.**
Rating	**excellent**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**it is in the forefront of the issues involved.**
Rating	**excellent**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**It is very good here, as "only" 20 sites are involved, and it would be better, of course, with a larger sample size, given the internal variation of response. Also, I would be happier with at least a modicum of information on if the birds respond directly to the changes. THis would lend weight to the proposal, I**

	think.
Rating	very good

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	top notch
Rating	excellent

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	it's very good, lacking only some response variables relating to the bird use of areas with different management.
Rating	very good

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	Looks like complete coverage
Rating	excellent

Additional Comments

Comments

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	Good track record
Rating	excellent

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	It looks adequate, although high.
Rating	very good

Overall

Provide a brief explanation of your summary rating.

Comments	excellent
Rating	excellent